

themselves at the ends of the line, and watched for meteors, carefully noting the times of their appearance, and their courses. By these means, the observers were enabled to identify twenty-two of these objects; and the data thus derived, yielded satisfactory results as to height and velocity.

The most remarkable feature of their observations, was, that one of the meteors instead of falling, *moved in a direction away from the earth.*

A curve in the train of a meteor with the convexity downward, would indicate a motion from the earth.

Nearly all the phenomena of meteors have been accounted for by theories which men of science regard, if not as satisfactory, at least as plausible; but I believe, no astronomer has yet had the hardihood to attempt to explain, how a meteor can approach near enough to our planet to be inflamed by its atmosphere, and become visible to its inhabitants, and then move off in defiance of the law of gravitation.

I have detailed experiments which show that stationary objects in the heavens, under certain circumstances, appear associated with flashes of light which are curved with their convexity towards the earth; and I trust that what I have said will convince the Academy that there is the greatest probability that the anomalous appearance described by Messrs. Brandes and Benzenberg, was only an example of the optical illusion which it is the purpose of this paper to explain.

Notice of Remains of Extinct Vertebrata, from the Valley of the Niobrara River, collected during the Exploring Expedition of 1857, in Nebraska, under the command of Lieut. G. K. Warren, U. S. Top. Eng., by Dr. F. V. Hayden, Geologist to the Expedition.*

BY JOSEPH LEIDY, M. D.

During the Exploring Expedition of the last year in Nebraska, under the command of Lieut. G. K. Warren, the Geologist of the Expedition, Dr. F. V. Hayden collected a number of remains of mammals and turtles, from a deposit, in the valley of the Niobrara River (Swift-running-water; L'eau-qui-court), which he suspects to be of pliocene age. The collection is an exceedingly interesting and important one; and the anatomical characters of the specimens support the opinion of their discoverer, that the formation, from which they were obtained, belongs to the later tertiary period.

The extinct fauna of the Niobrara is especially rich in remains of ruminating and equine animals. Among the former are several peculiar genera, of which two are closely allied to *Oreodon* and *Leptauchenia*, of the miocene deposit of the Mauvaises Terres: one is allied to the Musk-deer, and another closely approaches the Camel. Besides the remains of a true species of *Equus*, the col-

*WASHINGTON, (D. C.) March 8, 1858.

Capt. A. A. Humphreys, T. E., Ch'ge Off. Expl. and Surveys.

SIR: Professor Joseph Leidy has prepared a "Notice of Remains of Extinct Vertebrates," constituting twenty-eight new species, collected by Dr. Hayden along the Niobrara River, on the Expedition placed under my command by the War Department, during the past summer, which, it is desirable, should be published at once in the Proceedings of the Academy of Natural Sciences of Philadelphia. The permission of the Honorable Secretary of War, to make the publication, is requested.

Very respectfully, sir, your obedient servant,

G. K. WARREN,

Lieut. Top. Eng'rs.

Submitted to the Secretary of War. The publication is approved by him.

A. A. HUMPHREYS,

Capt. Top. Eng'rs. in Charge.

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lection contains those of two species of *Hipparion*, and several peculiar genera of the equine family. There are also remains of several species of canine and feline animals, of a small species of Beaver, and of a species of Porcupine more nearly allied to that of the old world than to our own recent one. The collection further contains remains of a Rhinoceros, resembling that of India, those of a new species of Mastodon, and those of a large Elephant.

One of the most remarkable circumstances, in relation with this extinct fauna, is that it is more nearly allied to the present recent one of the old world than to that of our own continent. From a comparison of our recent fauna and flora with that of the eastern continent, the deduction has been made, that the western continent is the older of the two, geologically speaking, whereas, the Niobrara fauna would indicate just the reverse relationship of age. A number of similar instances show that totally different faunæ and floræ may be cotemporaneous, and do not necessarily indicate different periods of existence.

CARNIVORA.

CANIS SÆVUS, Leidy.

Several much mutilated fragments of two lower jaws indicate a species of Wolf, about the size of the *Canis occidentalis*.

Height of fragments of lower jaws below the sectorial tooth,	14 lines and $15\frac{1}{2}$ lines.
Antero-posterior diameter of the lower sectorial tooth,	13 lines and $13\frac{1}{2}$ lines.

The present extinct species is not so large as the one whose remains have been discovered in association with those of the *Megalonyx*, *Tapirus*, *Equus*, &c., on the banks of the Ohio River, Indiana, to which the name of *Canis primævus* was inadvertently applied (Proc. Acad. Nat. Sci. vii. 200; Journal A. N. S. iii. 167), and which may now be distinguished by that of *CANIS DIRUS*.

CANIS TEMERARIUS, Leidy.

A second species of Wolf is inferred to have existed, from two small fragments of an upper and a lower jaw, containing the sectorial teeth, and the first upper tubercular tooth, about the size of the corresponding parts of the Red Fox, *Canis fulvus*.

Height of fragment of lower jaw below the sectorial tooth,	8 lines.
Antero-posterior diameter of lower sectorial tooth,	$7\frac{1}{2}$ "
Antero-posterior diameter of upper sectorial tooth	7 "
Transverse diameter of first upper tubercular tooth,	$6\frac{1}{2}$ "

CANIS VAFER, Leidy.

A third species of *Canis*, of small size, is indicated by the greater portions of both sides of a lower jaw, containing nearly all the teeth, which do not differ in form from those of the Red Fox.

Depth of lower jaw at the sectorial tooth,	6 lines.
Length of entire molar series,	$21\frac{1}{2}$ "
Antero-posterior diameter of sectorial tooth,	$5\frac{1}{2}$ "
Length of crown of canine tooth,	$5\frac{1}{4}$ "

CANIS (EPICYON) HAYDENI, Leidy.

Since the preceding descriptions of wolves were written, Dr. Hayden has sent to me for examination a specimen belonging to the Niobrara collection, consisting of a much mutilated fragment of a lower jaw of a huge wolf.

The fragment contains the sectorial molar, the two preceding premolars, and the sockets for the tubercular molars. The teeth preserved in the specimen are much worn, indicating an old individual, but they have the form of the corresponding teeth in the recent Wolf. The tubercular molars have occupied more than an inch of space, though more crowded in position than in recent wolves. The last, as well as the first, was inserted by widely separated fangs

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and was implanted almost directly backward in the ascending border of the ramus, above the level of the heel of the sectorial molar.

The portion of jaw is remarkable for its robustness; the thickness of the anterior border of the ramus an inch above the ordinary line of the teeth being eight lines.

The species is respectfully dedicated to Dr. F. V. Hayden, the untiring geological explorer of the region of the Upper Missouri.

Depth of jaw at sectorial molar,	21 lines.
Thickness of jaw below sectorial molar,	9 "
Extent of space occupied by the sectorial and preceding two premolars,	34 "
Antero-posterior diameter of sectorial molar,	17 "
Transverse diameter of sectorial molar,	7½ "
Space occupied by the tubercular molars,	14 "

FELIS (PSEUDÆLURUS) INTREPIDUS, Leidy.

An extinct species of the cat tribe is indicated by a well preserved specimen of the lower jaw of an animal intermediate in size to the Panther (*Felis concolor*) and the Lynx (*Felis canadensis*). The jaw together with the teeth present a repetition of form of the corresponding parts in known species of cats, except that in the middle of the hiatus behind the canine tooth there is a smaller socket for a rudimental premolar, as in the extinct *Felis (Pseudælurus) quadridentatus* of Europe, and the sectorial molar has a basal heel and tubercle about half as well developed as in the preceding teeth.

Length of the lower jaw from the condyle	58 lines.
Height of the lower jaw at coronoid process	27 "
Height of the lower jaw below middle molar	11 "
Length of molar series (3)	21 "
Antero-posterior diameter of sectorial molar	7 "
Height at posterior cusp of sectorial molar	5½ "

ÆLURODON FEROX, Leidy.

The only specimen upon which this name is proposed, consists of an isolated, unworn, upper sectorial molar tooth, which has about the size and proportionate form of that of the common Wolf of this country or Europe, but has a tubercle or lobe in advance of the principal cusp nearly as well developed as that occupying the same position in the cats.

Breadth of crown antero-posteriorly and externally	13 lines.
Length of crown at principal cusp	8½ "
Thickness of crown at base anteriorly	7 "
Thickness at base of principal cusp	5½ "

RODENTIA.

HYSTRIX (HYSTRICOPS) VENUSTUS, Leidy.

Two isolated molar teeth, probably both referable to the same animal, have about the same size and nearly the same constitution as those of the Crested Porcupine (*Hystrix cristata*,) of Europe. One of the teeth appears to correspond with the first upper molar of the right side of the latter animal. It has a single deep fold on the inner side, and a less extensive one on the outer side. The crown, about one-fourth worn, presents on the triturating surface the fold extending from the inner and outer side, and in advance a bow-like enamel islet, and behind a transverse boot-like islet and a small circular one. The second specimen, viewed as an upper left tooth, has a deep fold on the inner side, in advance of which on the triturating surface is an oblique enamel islet, and behind, two similar ones.

Antero-posterior diameter of the first molar	5½ lines.
Transverse diameter of the first molar	4 "
Antero-posterior diameter of the second molar	3 "
Transverse diameter of the second molar	3½ "

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CASTOR (EUCASTOR) TORTUS, Leidy.

The greater part of an upper jaw, consisting of the upper maxillæ and inter-maxillæ containing the greater portion of the incisors, together with the anterior three molars of both sides, indicates an old individual of a small Beaver. The jaw and incisor teeth have the same form as the corresponding part of the recent Beaver. The first molars present nearly the same arrangement as in the latter. The succeeding two molars are nearly worn to the base of their crown; and they have the enamel folds on the triturating surface directed much more obliquely from the outer side inward and backward than they would ever appear to do in the same condition in the recent Beaver. The size of the species was about half that of the latter animal.

Length of space occupied by the series of four molars	6 lines.
Length of space from first molar to the inter-incisive crest	14 "
Breadth of face outside of second molars	7 "
Diameter of incisors	2 "
Diameter of first molar	2½ "

RUMINANTIA.

CERVUS WARRENI, Leidy.

This species of deer is indicated by a fragment of a lower jaw containing the posterior four molar teeth, portions of two last inferior molars, a small antler, and a small fragment of a second. The form of the teeth is the same as in *Cervus virginianus*, and their size accords with that in full grown and robust individuals of this species. The antler is perhaps that of a young animal. The frontal process supporting it is half an inch in length and thickness. A little less than an inch above the ring of the antler it divides into two diverging prongs, of which one is broken off, and the remaining one is two and a quarter inches long.

Length of series of the posterior four lower molars 30 lines.

The species is respectfully dedicated to Lieut. G. K. Warren, U. S. A., commander of the expedition, during which the remains were collected forming the subjects of the present communication.

MERYCODUS NECATUS, Leidy.

Proc. Acad. Nat. Sci. vii. 90; *ibid.* viii. 89.

This genus and species were originally proposed on a small fragment of a lower jaw of a ruminating animal, belonging to the collection of Prof. Hall, of Albany, and discovered by Messrs. Meek and Hayden on Bijou Hill, Nebraska, in the summer of 1853.

The collection from the Niobrara contains the greater portion of four halves of lower jaws, together exhibiting a full series of molar teeth.

The form of the jaw supporting the teeth is much like that of the Deer, except that its base turns up posteriorly as in the Musks.

The inferior true molars have much more nearly the form of those of the Sheep than of those of the Deer or Musk. The posterior two premolars have crowns very much like that of the second premolar of the Deer, and the first is like the corresponding one in the same animal.

Depth of lower jaw at first premolar	6 lines.
Depth of lower jaw at last true molar	8½ "
Length of series of six molars	26 "
Length of series of true molars	17 "

PROCAMELUS OCCIDENTALIS, Leidy.

This genus and species are founded on several fragments of jaws, with teeth of several individuals of an animal allied to the Camel, and about two thirds its size.

The posterior fragment of a lower jaw presents the same general form as in the corresponding part of the Camel, but is broader at the ramus in relation with its height than in the latter. The posterior coronoid process is well described. 1858.]

veloped; and the upper part of the ramus is more strongly depressed externally than in the Lama (*Auchenia*). The body of the lower jaw is relatively deeper than in the Camel, though not so robust; and the two sides are cœossified by a comparatively short symphysis.

Six molar teeth form a closed row in the lower jaw, being two additional to the number in the Camel and Lama. The true molars and the last premolar have nearly the same form as the corresponding teeth of the Camel. The second premolar is a reduced one from that behind it; and the first premolar has a laterally compressed ovate crown implanted by two fangs.

In a small fragment of a lower jaw, in the middle of the hiatus, in advance of the closed row of molars, there is the fang of a tooth, which appears to have been a caniniform premolar. The mental foramen is just in advance and below the position of this tooth. A foramen likewise exists below the third premolar of the closed row of teeth, corresponding to that more posteriorly situated in the Camel and Lama.

Two mutilated but connecting fragments of an upper jaw present the hard palate more deeply arched than in the Camel or Lama; and the face narrows in advance of the molar teeth as in the latter. A palatine foramen exists opposite the interval of the second and third premolars. The infra-orbital foramen occupies the same relative position as in the Camel.

As in the lower jaw, six molar teeth form a closed row in the upper jaw. The true molars, though much mutilated in the specimens under examination, appear to possess the same form as those of the Camel. The last premolar is also like the corresponding tooth of the latter. The second premolar is like the first one of the Camel, with the exception that it has the antero-internal fold of its crown as well developed as the posterior fold, which it joins at the base. The first premolar is like the first one of the series in the Lama, having a trilobate, flattened, oval crown.

Height of the ramus of the lower jaw, from its base to its condyle,	4 inches 10 lines.
Depth of lower jaw below last molar,	2 "
Distance from last molar to the end of the posterior coronoid process,	4 "
Depth of lower jaw at middle of the hiatus of the teeth,	10 "
Breadth of face in advance of upper molars,	1 " 6 "
Breadth of face at back molars,	4 "
Length of upper molar series,	4 " 8 "
Length of lower molar series	4 " 10 "
Length of upper true molar series,	3 "
Length of lower true molar series	3 " 5 "

MEGALOMERYX NIOBRARENSIS, Leidy.

This genus and species are proposed on two lower molar teeth, in the Niobrara collection, which indicate a ruminating animal of the largest size. One of the specimens is apparently a first true molar, and is inserted into a fragment of the jaw by a pair of strong fangs. The crown is two-thirds worn away, and presents the same form as the corresponding tooth of the Sheep in the same condition. The antero-postero diameter of the crown is 21 lines; the transverse diameter $11\frac{1}{2}$ lines.

The second specimen is an isolated, nearly unworn, first or second true molar, with the form nearly the same as in the corresponding teeth of the Sheep. Its length is three and one-third inches; its antero-posterior diameter, at the triturating surface, is two inches, and just above the developing fangs an inch and a half; the transverse diameter, in the former position, is seven lines, and in the latter nine and a half lines.

MERYCOCHOERUS PROPRIUS, Leidy.

The genus and species are based on several halves of upper and lower jaws [March,

of a large animal, discovered by Dr. Hayden in the red grit bed of Niobrara, near Fort Laramie, Nebraska. The formula of dentition and relative position of the teeth with one another are the same as in *Oreodon*. The true molars present a repetition of the form and structure of those of the latter genus, and the premolars nearly so. The upper anterior two premolars have a greater breadth in relation with their length and thickness than in *Oreodon*; and the anterior two lower ones are more crowded in position.

The side of the face turns rather abruptly outward and backward from above the position of the true molars, more even than in the Hog, whereas, in the three described species of *Oreodon*, it slopes gradually backward and outward, more as the Wolf. The infra-orbital foramen is above the interval of the first and second true molars, while in *Oreodon* it is above the third premolar. The malar bone below the orbit is, relatively to the size of the animal, deeper than in the Hog, but in *Oreodon* it is not more so than in the Wolf.

Length of upper series of molars,	74 lines.
Length of lower series of molars	69 "
Length of upper series of true molars,	43 "
Length of lower series of true molars.	45 "

MERYCHYUS, Leidy.

The formula of dentition, and the relative position, structure, and form of the teeth are nearly the same as in *LEPTAUCHENIA*. In this genus, of which the remains of two species, *L. decora* and *L. major*, were discovered by Dr. Hayden in the upper miocene beds of White River, near Eagle Nest Butte, Nebraska, the formula of dentition and relative position of the teeth with one another are the same as in *OREODON*. The crowns of the molars are relatively much longer, and at their outer part are more vertical than in the latter, differing in these respects very much as the molars of the Ox and the Deer. The outer lobes of the upper true molars are separated quite to the fangs by narrow, deep, vertical folds inclining forward. The inner lobes of the lower true molars are separated by narrow, overlapping folds, and present internal plane surfaces, while those of *Oreodon* are folded as in the Deer. The premolars are more crowded than in *Oreodon*; and in the case of the upper ones, the most elevated point of the triturating surface is much more anterior than in the latter. The enamel pits of the triturating surfaces of the true molars are very narrow in comparison with those of *Oreodon*, and in the lower teeth are quickly obliterated. The canines are relatively small in comparison with those of the latter genus.

In *Merychys*, of which there appear to be three species, as indicated by the remains discovered by Dr. Hayden in the pliocene deposit of Niobrara, the folds separating the outer lobes of the upper true molars have the same form as in *Leptauchenia*, but are not so deep, do not incline forward, and do not divide the crown through its base. The lower true molars have their inner surfaces as plane as in the Camel, and have their lobes but feebly separated in comparison with the condition in *Leptauchenia*. The canines are as well developed as in *Oreodon*.

MERYCHYUS ELEGANS, Leidy.

This species is founded on several halves of upper and lower jaws, containing admirably preserved series of teeth. The animal was nearly the same size as *Leptauchenia major*.

Length of the upper jaw, from the back molar tooth to the front of the incisors,	43 lines.
Length of upper series of seven molars,	37 "
Length of lower series of six molars	34 "
Length of upper series of true molars,	22 "
Length of lower series of true molars	23 "
Depth of lower jaw at first true molar,	11 "
Depth of lower jaw at last true molar	15 "

MERYCHYUS MEDIUS, Leidy.

The second species is founded upon a fragment of the lower jaw, containing the true molars, an isolated upper last true molar, and an isolated upper canine tooth.

Length of series of lower true molars,	34 lines.
Antero-posterior diameter of the upper last true molar,	14½ "

MERYCHYUS MAJOR, Leidy.

This species is proposed upon a fragment of the upper jaw containing the last pair of premolars and the succeeding pair of true molars. The latter teeth differ from the isolated upper molar of the preceding species in possessing a well defined basal ridge, of which the faintest traces only exist in *M. elegans* and *M. medius*.

Length of space occupied by the two premolars and succeeding two true molars,	44 lines.
Antero-posterior diameter of second true molar,	16 "

SOLIPEDIA.**ANCHITHERIUM (HYPOHIPPIUS) AFFINIS**, Leidy.

A single specimen consisting of the crown of an upper molar tooth, in Dr. Hayden's collection, has the same form as the corresponding teeth of *Anchitherium*, except that the outer surfaces of its external lobes present no trace of median rising. It indicates an animal larger than *A. aurelianense* and about the size of *Palæotherium crassum*.

Antero-posterior diameter externally	14 lines.
Transverse diameter anteriorly	13½ "

ANCHITHERIUM (PARAHIPPUS) COGNATUS, Leidy.

The Niobrara collection contains three isolated unworn crowns of upper molar teeth, which have the same form as the upper deciduous molars of *Anchitherium Bairdi* or *A. aurelianense*, except that the outer extremity of the prolongation of the postero-internal lobe branches into several short folds. These latter have the same arrangement as similar but more numerous folds in the same position in *Merychippus*.

Length of the series of three molars,	31 lines.
Antero-posterior diameter of the first molar,	12 "
Transverse diameter of the first molar	8 "
Antero-posterior and transverse diameters of the third molar,	9 "

Independent of the remains of the anchitherioid genera *Parahippus* and *Hypohippus*, the collection made by Dr. Hayden contains numerous fragments of the skeleton of apparently six different equine animals, which, however, exhibit such an interchange of characters, that at present it appears impossible to specify the isolated teeth and bones. The following genera and species appear to be indicated by the more characteristic specimens of the collection.

EQUUS EXCELSUS, Leidy.

This species is about the size of the largest variety of the recent Horse, as indicated by molar teeth and bones of the limbs. The teeth do not differ in constitution from those of the recent Horse; and none of them present a greater degree of complication of the enamel folds on their triturating surface.

EQUUS (PROTOHIPPIUS) PERDITUS, Leidy.

A second species of Horse, of small size, is especially indicated in the Niobrara collection, by a fragment of an upper jaw containing the posterior four molars. The portion of jaw is like the corresponding part in the recent Horse. The molar teeth have their crowns about one-fourth worn. The enamel folds on the triturating surfaces are even less complex than in the recent Horse, and the antero-internal fold or column has the same form, direction and mode of

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continuation as the postero-internal one. The space occupied by the four teeth is about three inches in length, and about ten lines in breadth. Dr. Hayden's collection also contains bones of the limbs which correspond in relative size with the jaw and teeth above noticed.

Figure 1, plate 7, of M. Gervais, Rech. s. l. Mammifères Fossiles de l'Amérique méridionale, apparently represents a species of the same equine subgenus as the above. No extent of attrition of the corresponding teeth of the domestic Horse will produce the same appearance indicated in this figure.

MERYCHIPPUS, Leidy.

This genus is a much more remarkable one than could have been anticipated from an examination of the specimen alone from which it was first characterized. The specimen alluded to consists of the anterior upper two large molars, contained in a small fragment of the jaw, and was obtained by Dr. Hayden, at Bijou Hill. The two teeth are intermediate in form to the corresponding ones of *Anchitherium*, and the upper true molars of the Deer, and they bear a strong resemblance to those referred above to the anchitherioid genus *Parahippus*. From the teeth of the latter, they differ only in having their intermediate lobes prolonged posteriorly past the inner conical lobes, so as to make them assume the appearance of the inner lobes of the upper true molars of ruminants.

In a fragment of the upper jaw of a young animal, in the Niobrara collection, apparently belonging to a second species of *Merychippus*, the second and third temporary molars and their permanent successors are contained. The temporary molars have the same form as the teeth from which the genus was first characterized would have, in a more worn condition. They are invested with cementum, though in less quantity than is usual in the Horse, and it is more readily detached, which appears to have been the case in the two teeth from Bijou Hill. The crowns of the permanent teeth contained within the fragment of jaw under examination have the same form as the corresponding teeth of the recent Horse, with the modifications above noticed characterizing the subgenus *Protohippus*.

MERYCHIPPUS INSGNIS, Leidy.

Proc. A. N. S. viii. 311; 1857, 89.

This species was characterized from the fragment of jaw containing what now appear to me to be the upper anterior two temporary molars, from Bijou Hill. The Niobrara collection contains a portion of the upper jaw, which appears to belong to this species, having an entire series of permanent molars, (exclusive of the small one,) so far worn as to be inserted by fangs. The series of teeth occupy a space of almost four inches in length and ten lines in breadth.

MERYCHIPPUS MIRABILIS, Leidy.

Appears to be a distinct species from the former, of larger size. It is indicated in the Niobrara collection, by a specimen previously noticed, consisting of a fragment of the upper jaw, containing the second and third temporary molars and their permanent successors. Another specimen, in the same collection, belonging apparently to this species, consists of a fragment of the upper jaw of an adult individual, containing the back four molars, which are so far worn as to be inserted by fangs. The four teeth occupy a space of three and one-third inches in length and an inch in breadth.

The two fragments of jaws, above mentioned, have a deep depression or lachrymal fossa in advance of the orbit, as in the Deer, Oreodon, &c.

HIPPARION S. HIPPOTherium OCCIDENTALE, Leidy.

Hipparion occidentale: Pr. A. N. S. vii. 59; 1857, 89.

The remains of this species were originally discovered by Dr. Hayden in a superficial deposit at White River, Nebraska. A number of molar teeth in the Niobrara collection appear to belong to the same species.

HIPPARION S. HIPPOTherium SPECIOSUM, Leidy.

Hipparion speciosum: Pr. A. N. S. viii. 311; 1857, 89.

The remains of a smaller species of *Hipparion* than the preceding, were originally discovered in 1858.]

ginally discovered by Dr. Hayden on Bijou Hill. Numerous teeth of the species are contained also in the Niobrara collection.

PACHYDERMATA.

RHINOCEROS CRASSUS, Leidy.

The Niobrara collection contains small fragments of two lower jaws of young animals, a much worn upper incisor, a last upper molar, and an upper premolar, apparently of the deciduous series, of a species of Rhinoceros, which appears to have had almost the same size and formula of dentition as the recent Indian Rhinoceros, (*R. indicus*.)

One of the fragments of lower jaws, consisting of the symphyseal portion with sockets for four incisors, indicates these to have had the same relation of size and form as in *R. indicus*.

The upper lateral incisor has nearly the form and size of the corresponding tooth of *R. indicus*. The antero-posterior diameter of its crown is two and one-third inches, and its transverse diameter three-fourths of an inch.

The last upper molar, which belonged to an old individual as indicated by its worn condition, is of the form usual in most species of living Rhinoceros. Its antero-posterior diameter internally is two inches, and its oblique diameter posteriorly about half an inch more.

The upper deciduous premolar has the narrower portion of its crown anteriorly. The triturating surface of the specimen presents a tract of dentine on the outer wall and summits of the inner lobes of the tooth. The outer wall has a median ridge externally, corresponding to the most elevated point of its triturating surface. The anterior border of the outer wall has the same form as the posterior one, but is shorter and more prominent. The inner lobes are embraced by a strong basal ridge, as in *R. occidentalis* and *Aceratherium incisivum*. The antero-internal lobe curves inward and backward, and the succeeding lobe is transverse. Three conspicuous vallies bound the lobes, of which the middle one is deepest and the anterior one least so. From the outer wall of the tooth two folds project into the middle valley, and the posterior of these join one springing from the anterior face of the postero-internal lobe, thus isolating a deep pit from the valley. If the fossil tooth were worn away to a level with its basal ridge it would exhibit four distinct enamel pits; one corresponding to the outer end of the anterior valley, two for the middle valley, and one for the posterior valley.

Antero-posterior diameter of the tooth externally,	19 lines.
Transverse diameter of the tooth posteriorly,	19 "
Transverse diameter of the tooth anteriorly,	16 "

MASTODON (TETRALOPHODON) MIRIFICUS, Leidy.

One of the most interesting discoveries of Dr. Hayden in the pliocene deposit of the valley of the Niobrara, is the greater portion of the lower jaw of a Mastodon, most undoubtedly distinct from that species whose remains are so abundantly found in later deposits in the United States. The specimen belonged to an old individual, as the last molar tooth had protruded and is considerably worn off at its anterior two-thirds; and it indicates a much smaller animal than the *M. ohioiticus*. The form of the jaw is like that of the existing Elephant of India. A single tooth, the last molar, occupies each side of it, and resembles the corresponding one of *M. angustidens*, of Europe, or of *M. sivalensis*, of the Sivalic Hills, of India. The crown measures nine inches antero-posteriorly, and three and a half inches transversely, and possesses six transverse rows of conical lobes closely crowded. In advance of the sixth molars, preserved in the specimen, no traces of alveoli are left for preceding teeth, but a sharp sigmoid ridge extends to the front of the jaw.

The greatest breadth of the jaw outside the position of the molars is	15 inches.
Length from back of last molar to anterior end of the jaw,	16 "
Length of the sigmoid ridge in advance of the molars,	9 "

[March,

Elephas (*Euelephas*) *Imperator*, Leidy.

The Niobrara collection also contains the anterior portion of an upper molar tooth of an Elephant of larger proportions than any which are known to us. The triturating surface is within a line or two of five inches in breadth, and within a space of seven inches only eight enamel folds or double plates exist. In the most thick plated variety of teeth of the *Elephas americanus* which we have seen, in the same space ten folds were counted. As in the latter, *E. primigenius*, and the recent Elephant of India, the enamel plates become worn on the triturating surface into transverse, strongly crenulated ellipses.

The fragment of the tooth has been assumed to belong to an unnamed species from the fact that it was found in association with a fauna very distinct from any previously noticed.

CHELONIA.

Testudo (*Stylemys*) *Niobrarensis*, Leidy.

The Niobrara collection contains numerous fragments of bones of the shell of a species of emydiform, Land Turtle, from individuals of different ages. The fragments do not permit the restoration of any extent of either the carapace or sternum, but they are sufficient to indicate that the species grow to the size of the *Testudo nebrascensis*, which it also resembled in structure and form, except that the anterior and posterior marginal plates are strongly everted, while they are only slightly so in the species just named.

Descriptions of new species of Neuropterous Insects, collected by the North Pacific Exploring Expedition under Capt. John Rodgers.

BY P. R. UHLER.

Libellula Linn.

1. *L. Japonica*. ♂ Fuscous, pubescent; labium at base, spot and lower margin of the labrum, superior portion of the sides of the front, line between the antennæ, vertex, posterior lobe of the eyes and pubescence of the entire head black; labial palpi, labrum and spots upon the posterior lobe of the eyes yellowish; front subbilobate, and together with the stemmata testaceous; eyes and occiput brownish, the latter with long black pubescence: thorax fulvous, with a middle longitudinal black line, and a humeral and pleural oblique one, both of which are double, the humeral one confluent at the origin of the wing, the other hardly so; a pale testaceous spot occupies the surface between the two pairs of double lines, and a trigonal one behind the posterior line, surface between the pairs of wings pale, posterior lateral edge of the pectus black; wings hyaline, sub-infusate at their origin, pterostigma yellowish-fuscous, narrow, margined anteriorly and posteriorly with a black nervule, costal nervule pale fulvous in the middle, blackish at each end: abdomen trigonal, sub-depressed, plumbeous, four basal segments fuscous, lateral and middle carina and transverse elevated edges of the segments black, a small lanceolate yellow spot upon the last segment, occupying its whole length, venter blackish, with a yellow spot upon each side of the segments, spots becoming gradually smaller as they advance posteriorly; caudal appendages black, sub-fusiform, acute, anal one broad, triangular, dilated in the middle, sub-truncate at tip, about one-fourth shorter than the caudal ones: legs blackish, coxæ and posterior surface of the anterior femoræ pale.

Hakodadi, Japan.

Length of posterior wing 15 lines. Pterostigma $1\frac{1}{2}$ lines. Total length 20 lines. Three rows of discoidal areoletz, 12 antecubital cross-nervules.

1858.]